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**Patent and Trademark Office**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/241,695    02/02/99    MIYANAGA

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MMC1/0312

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EXAMINER
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200 WEST ADAMS STREET  
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CHICAGO IL 60606

U.S. ART UNIT	PAPER NUMBER
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2811  
DATE MAILED:

03/12/01

**Please find below and/or attached an Office communication concerning this application or proceeding.**

**Commissioner of Patents and Trademarks**

# Office Action Summary

Application No.  
**09/241,695**

Applicant(s)

**Miyayaga et al.**

Examiner

**Shouxiang Hu**

Group Art Unit

**2811**



☒ Responsive to communication(s) filed on Dec 28, 2000

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire three month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

## Disposition of Claim

☒ Claim(s) 1, 3, 15, 18, 21, 24, and 27-55 is/are pending in the application

Of the above, claim(s) 35-41 and 50-55 is/are withdrawn from consideration

☐ Claim(s) \_\_\_\_\_ is/are allowed.

☒ Claim(s) 1, 3, 15, 18, 21, 24, 27-34, and 42-49 is/are rejected.

☐ Claim(s) \_\_\_\_\_ is/are objected to.

☐ Claims \_\_\_\_\_ are subject to restriction or election requirement.

## Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on \_\_\_\_\_ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☒ All ☐ Some\* ☒ None of the CERTIFIED copies of the priority documents have been

☒ received.

☐ received in Application No. (Series Code/Serial Number) \_\_\_\_\_

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\*Certified copies not received: \_\_\_\_\_

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

## Attachment(s)

☒ Notice of References Cited, PTO-892

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 5 and 15

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

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## DETAILED ACTION

### *Election/Restriction*

1. Claims 35-41 and 50-55 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to nonelected species, there being no allowable generic or linking claim. Election of species 1 was made **without** traverse in Paper No. 20.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 3, 15, 18, 21, 24, 27-34 and 42-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. (5,893,740) in view of Ko et al. (5,686,321) and Mikoshiba (JP 56060061 A).

Chang et al. disclose a semiconductor IC device (Figs. 1-3), comprising MOSFETs and each of the MOSFETs comprises: a source region; a drain region; a channel forming region between the source and drain regions; an impurity region (18 or 28) being added with an

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impurity having an opposite conductive type to the source and drain regions and being formed under the channel forming region.

Although Chang et al. do not explicitly disclose that the concentration of the impurity in the channel forming region is from 1/100 to 1/10 of that in the impurity region, Ko et al. (Fig. 1-4; and see col. 4, lines 11) teach that it is desirable to form the channel forming region (63) with a doping concentration range that covers  $5 \times 10^{16} / \text{cm}^3$  through  $1 \times 10^{17} / \text{cm}^3$  and to form the punchthrough stopper region (24) with a doping concentration range that covers  $1 \times 10^{18} / \text{cm}^3$  through  $1 \times 10^{19} / \text{cm}^3$ , which covers a concentration ratio that is between 1/100 and 1/10. Besides, the impurity concentration of the impurity region is a well recognized parameter of importance subject to routine experimentation and optimization.

In addition, although Chang does not expressly disclose that the impurity is introduced from a direction of the  $\langle 110 \rangle$  axis with respect to the single semiconductor substrate, it is noted that it is old and well known in the art that the MODFET are normally formed with the wafer surface being parallel to the (100) crystal plane and with the channel being quite commonly aligned to  $\langle 100 \rangle$  crystal direction, as evidenced in Mikoshiba (Fig. 1), which compress a gate (5) aligned along a  $\{100\}$  direction on a (100) substrate. Therefore, the impurity doping direction in Chang's IC device can be presumedly inherently along the  $\langle 110 \rangle$  direction, as the arrow direction shown in Fig. 3C is about 45 degrees to the vertical. Besides, the exact doping direction for the impurity regions is also a well recognized parameter of importance subject to routine experimentation and optimization.

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Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the doping ranges of Ko et al. into Chang's semiconductor device with the concentration of the impurity in the channel forming region being from 1/100 to 1/10 of that in the impurity region and with the impurity region being doped along the <110> direction, so that faster switch speed and increased punchthrough voltage would be achieved.

Regarding claim 29, Chang's semiconductor device further comprises a pair of LDD region (14).

Regarding claims 18, 21, 24, 29-33 and 44-47, it is noted that it is old and well known in the art that semiconductor devices having MOSFETs with short channels can be used in microprocessors, including RISC or ASIC ones, and can be applied in cellular phones, personal handy phone systems and portable computers. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to make the semiconductor device and apply it to the above areas for achieving improved performance/cost combination in these areas.

Regarding claim 27, 34 and 48, Chang et al. further disclose that the peak impurity region is formed at a depth of from 50 to 60 nm (Col. 3, lines 58 and 59).

Regarding claim 28, it is noted that Chang's MOSFET is a bulk one on silicon substrate; and, bulk MOSFET is normally formed with a single crystal substrate.

Regarding claims 42 and 43, it is noted that Chang et al disclose that the device can be a COMS (col. 5, lines 1-10) and that Ar, P and B are all well known dopants.

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***Response to Arguments***

4. Applicant's arguments with respect to claims 1,3,15, 18, 21, 24, and 27 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

5. Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2811 Fax Center number is (703) 308-7722 or 308-7724. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ***Shouxiang Hu*** whose telephone number is (703) 306-5729. The examiner can normally be reached on Tuesday through Friday from 7:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, ***Tom Thomas***, can be reached on (703) 308-2772. The appropriate fax phone number for the organization where this application or proceeding is assigned is (703) 308-7724.

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Any inquiry of a general nature or relating to the status of this application should be directed to the **Technology Center Receptionists** whose telephone number is (703) 308-0956.

Shouxiang Hu  
March 1, 2001

  
TOM THOMAS  
SUPERVISORY PATENT EXAMINER